Advanced Control System Design for Hypersonic Vehicles, Phase I

Completed Technology Project (2008 - 2008)

Project Introduction

Guidance and control system design for hypersonic vehicles is more challenging than their subsonic and supersonic counterparts. Some of these challenges are (i) coupling between the aerodynamic, structural and propulsion sub-systems (ii) uncertainty involved in modeling these couplings and (iii) state-space constraints. Proposed research seeks to address these challenges using advanced robust control system design techniques. Key components of the proposed research are (i) hypersonic vehicle modeling, (ii) uncertainty representation, (iii) robust controller designs, and, (iv) robustness evaluation tools. Personnel at OSI have extensive experience in the area of flight control system design and flight vehicle modeling. Phase I research will demonstrate the feasibility by using existing longitudinal hypersonic vehicle models. Phase II research will pursue three dimensional modeling of the hypersonic vehicle alongside advancing the control system design. A complete version of the control system design software will be developed and provided to NASA by the end of Phase II work.

Anticipated Benefits

Potential NASA Commercial Applications: Hypersonic vehicle development is being actively pursued by NASA and the DoD for several missions. The control system architecture developed in this research will be applicable to global strike missions involving hypersonic missiles and different space access vehicle designs being pursued by space tourism companies.

Primary U.S. Work Locations and Key Partners

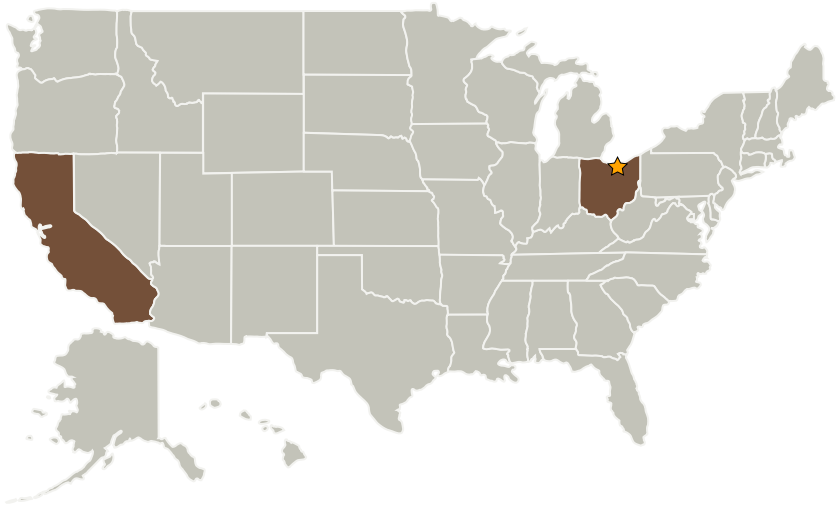

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Table of Contents

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Optimal Synthesis, Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Los Altos, California

Primary U.S. Work Locations	
California	Ohio

Project Transitions

January 2008: Project Start

July 2008: Closed out

Closeout Summary: Advanced Control System Design for Hypersonic Vehicles, Phase I Project Image

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

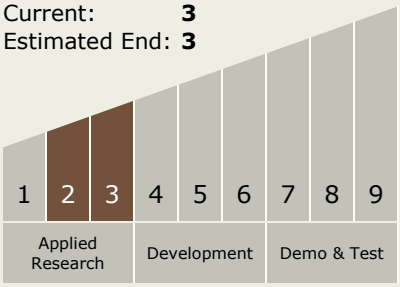
Carlos Torrez

Principal Investigators:

Veera V Vaddi
V. V. S. Vaddi

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.1 Aeroassist and Atmospheric Entry
    - TX09.1.2 Hypersonic Decelerators